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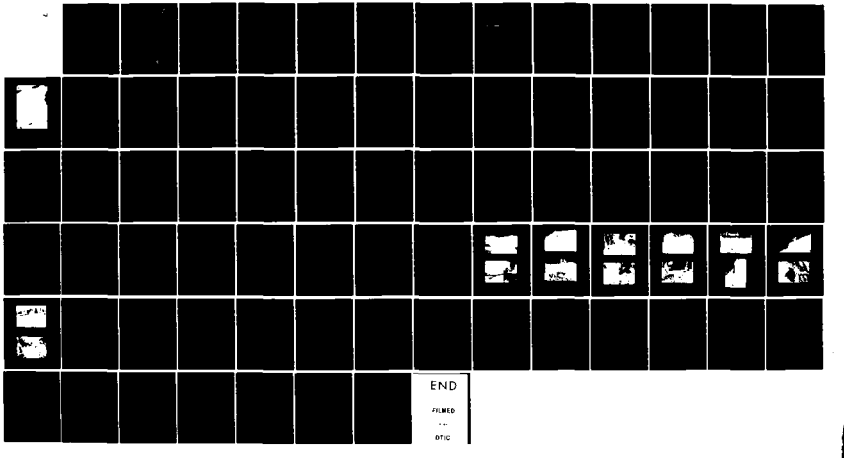

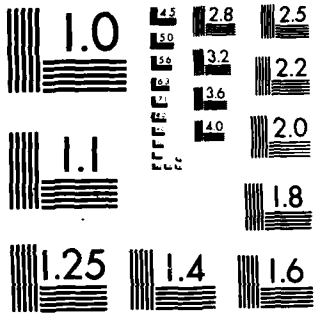

HOUSATONIC RIVER BASIN

WATERBURY CONNECTICUT

RISDON POND DAM
CT 00176

PHASE 1 INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY

NEW ENGLAND DIVISION, CORPS OF ENGINEERS

WALTHAM, MASS. 02154

APRIL 1981

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,

Housatonic River Basin
Waterbury Conn.
Risdon Pond Dam

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Risdon Pond Dam is an earthen embankment dam with a vertical stone masonry wall along most of the downstream toe. It has a total length of 150 ft. including a 28 ft. spillway which is near the center of the dam. The maximum height of the dam is 27 ft. at the left edge of the spillway. The visual inspection indicated that the dam was in fair condition. Based on its small size and high hazard classification and in accordance with the Corps Guidelines, the test flood is equal to ½ the Probable Maximum Flood.

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254

REPLY TO
ATTENTION OF:
NEDED

JUN 0 9 1981

Honorable William A. O'Neill
Governor of the State of Connecticut
State Capitol
Hartford, Connecticut 06115

Dear Governor O'Neill:

Inclosed is a copy of the Risdon Pond Dam (CT-00176) Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Environmental Protection, the cooperating agency for the State of Connecticut. In addition, a copy of the report has also been furnished the owner, Risdon Manufacturing Company, 2100 South Main Street, Waterbury, Connecticut 06700.

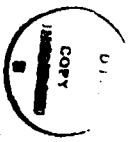
Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Protection for your cooperation in carrying out this program.

Sincerely,

C. E. EDGAR, III
Colonel, Corps of Engineers
Commander and Division Engineer

Incl
As stated



RISDON POND DAM
CT 00176

HOUSATONIC RIVER BASIN
WATERBURY, CONNECTICUT

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

Identification No.:	00176
Name of Dam:	Risdon Pond Dam
Town:	Waterbury
County & State:	New Haven County, Connecticut
Stream:	Hopeville Pond Brook
Date of Inspection:	December 3, 1980

BRIEF ASSESSMENT

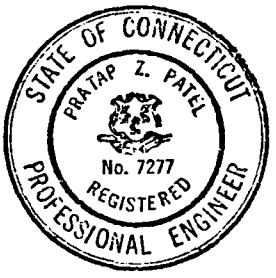
Risdon Pond Dam is an earthen embankment dam with a vertical stone masonry wall along most of the downstream toe. It has a total length of 150 feet including a 28 foot spillway which is near the center of the dam. The top width of the dam varies from a maximum of 24 feet at the left edge to a minimum of 15.5 feet at a point 58 feet from the left edge of dam. The maximum height of the dam is 27 feet at the left edge of the spillway. The reservoir storage at the top of dam is 11 acre-feet. There are both upstream and downstream spillway training walls composed of mortared and hand placed cobbles respectively. There is a 12 foot by 15 foot exposed wooden platform which houses an outlet control valve. The purpose of the dam is to make available a water supply for the Risdon Manufacturing Company, located nearby.

The visual inspection of Risdon Pond Dam indicated that the dam is in fair condition. The inspection revealed that the unprotected upstream face has been slightly eroded by wave action. The downstream face of the dam has a number of blocks which have been displaced, cracked or have unmortared joints. Grass, moss and small trees are growing out of some of the joints. There are several areas of seepage along the downstream wall on both sides of the spillway. There is a 3- foot deep depression on the left downstream wall of the dam. Also, there are five large tree stumps along the crest of the dam and a footpath traverses the crest.

Based on its small size and high hazard classification and in accordance with the Corps Guidelines, the test flood is equal to 1/2 the Probable Maximum Flood. The spillway will discharge 220 cfs or 16% of the test flood with the pool level at the top of the dam. The test flood flow of 1420 cfs will overtop the dam by 2.0 feet.

Based on the findings of the visual inspection and hydrologic and hydraulic analysis there is need for additional engineering input, analysis and design. This would include investigating the seepage along the downstream face of the dam; clearing the brush and trees from the crest, abutments, downstream face and toe; resetting/filling gaps in the downstream face and spillway walls, investigating the cause of missing and disloged masonry on the downstream wall, spillway training walls, and downstream channel walls, and recommending corrective measures; repairing and protecting the upstream face of the dam from wave erosion; performing a detailed hydrologic and hydraulic investigation to assess further the potential of overtopping the dam and the need for and the means to increase project discharge capacity.

The recommendations and remedial measures are described in Section 7 and should be addressed within one year after receipt of this Phase I Inspection Report by the owner.



Pratap Z. Patel, P.E.
Project Manager

Pratap Z Patel

Philip W. Genovese & Associates, Inc.
Hamden, Connecticut

This Phase I Inspection Report on Risdon Pond Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgement and practice, and is hereby submitted for approval.

ARAMAST MAHTESIAN, MEMBER
Geotechnical Engineering Branch
Engineering Division

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

JOSEPH W. FINEGAN, JR., CHAIRMAN
Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation: however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at

some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The Phase I Investigation does not include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

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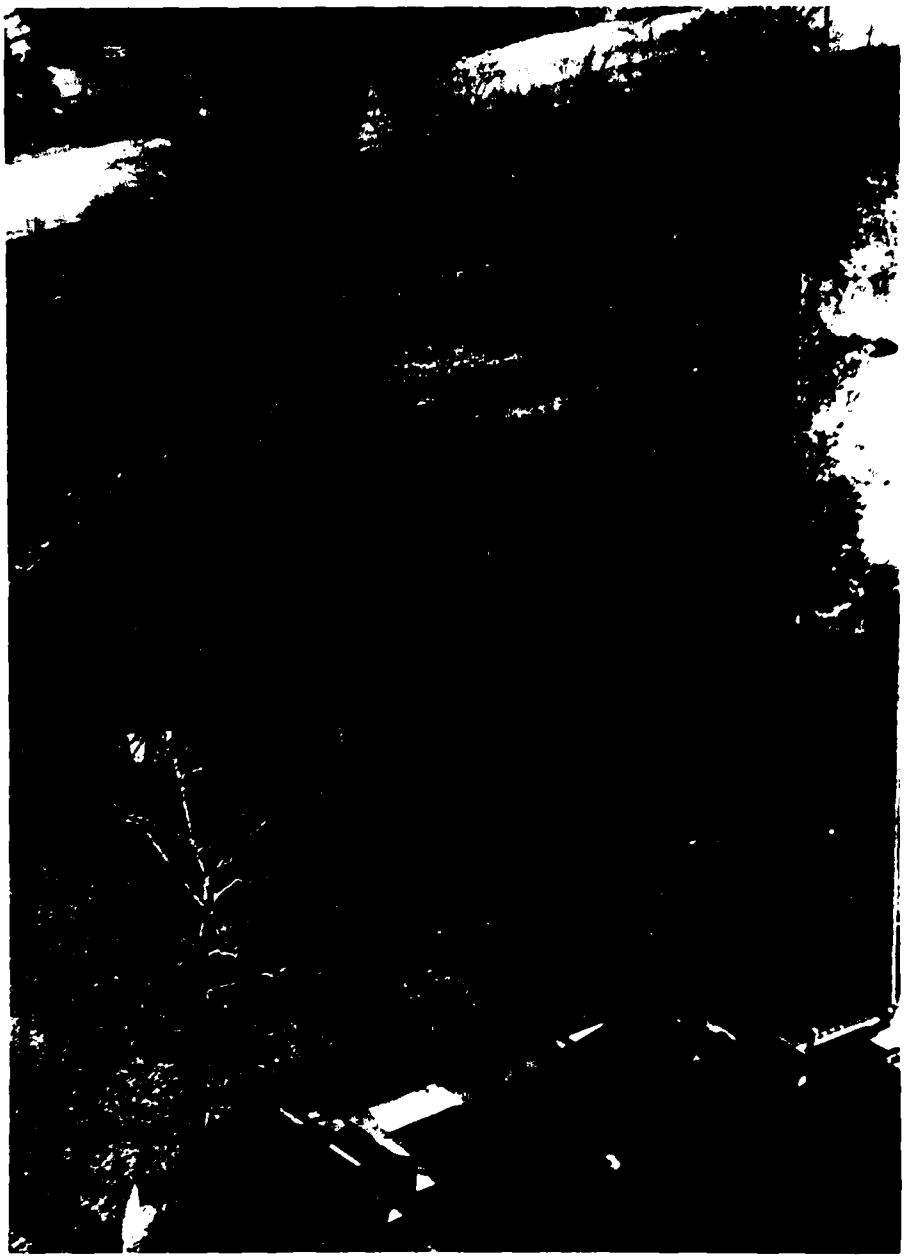

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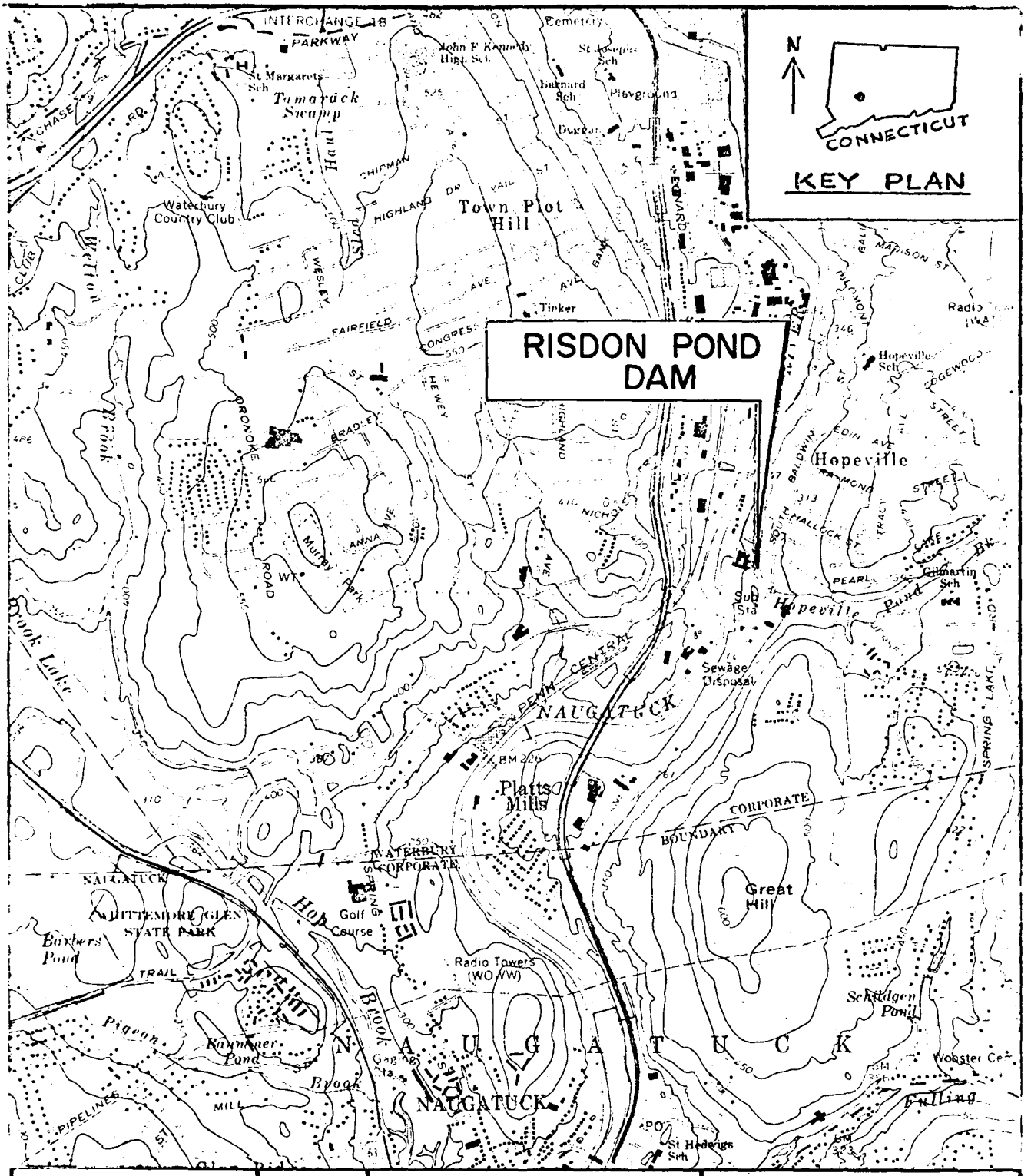
PHILIP W. GENOVESE AND ASSOCIATES, INC. ENGINEERS - HAMDEN, CT.		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Tamarack Swamp
Waterbury Country Club
Hopeville
Hopeville Pond
Platts Mills
Great Hill
NAUGATUCK
Golf Course
Radio Towers (WOWW)
Sewage Disposal
Sub Sta
Gilmartin Sch
St Hedwigs Sch
St Margarets Sch
John F Kennedy High Sch
St Josephs Sch
Barnard Sch
Hopeville Sch
Tinker
Cemetery
Playground
Radio
INTERCHANGE 18
PARKWAY
FAIRFIELD
CONGRESS
HIGHLAND
BRADLEY
ANNA
NICHOLS
PEARL
SPRING LAKE
PENN CENTRAL
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NATIONAL PROGRAM OF INSPECTION OF NON - FED DAMS
LOCATION MAP

NATIONAL DAM INSPECTION PROGRAM

PHASE I INSPECTION REPORT

RISDON POND DAM - CT 00176

SECTION I

PROJECT INFORMATION

1.1 General

a. Authority

Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Philip W. Genovese and Associates, Inc. has been retained by the New England Division to inspect and report on selected dams in South Central Connecticut. Authorization and notice to proceed were issued to Philip W. Genovese and Associates, Inc. under a letter of November 17, 1980 from Colonel William E. Hodgson Jr., Corps of Engineers. Contract No. DACW 33-81-C-0017 has been assigned by the Corps of Engineers for this work.

b. Purpose

1. Perform technical inspection and evaluation of non-federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-federal interests.

2. Encourage and prepare the states to initiate quickly effective dam safety programs for non-federal dams.

3. Update, verify, and complete the National Inventory of Dams.

1.2 Description of Project

a. Location

Risdon Pond Dam is located in the City of Waterbury in New Haven County, Connecticut. Risdon Pond is near the plant on the property of the Risdon Manufacturing Company on the east side of a four-lane highway. The dam impounds the waters of Hopeville Pond Brook, and is shown on the Waterbury, Connecticut Quadrangle with the approximate coordinates of North 41° 31.6', West 73° 02.4'.

b. Description of Dam & Appurtenances

Risdon Pond Dam is a rubble masonry dam with concrete-capped abutments and stone masonry training walls on both sides of the downstream channel which extend from the bottom of the spillway to a culvert which carries the stream under the Risdon Manufacturing plant and South Main Street, a four-lane highway. The total length of the dam is 150 feet, which includes a 28 foot stone masonry spillway with a concrete cap. The maximum structural height of the dam is 27.2 feet. At each end of the dam there is a 6-foot chain link fence. The upstream slope is underwater, but appears to slope out into the pond at about 5:1 from the edge of the crest.

Appurtenant structures consist of a concrete spillway, spillway channel and outlet works. The spillway consists of a 28 foot wide concrete floor slab with stone and mortar training walls. The spillway crest elevation is 276. The width of the downstream channel between the training walls varies from 37 feet at the dam to a constant width of 16 feet from a point 37 feet from the dam to the culvert. There is a 12-foot wide concrete bridge over the downstream channel located 90 feet from the dam and 48.6 feet from the face of the plant wall.

The outlet works consists of an exposed wooden platform which contains an intake control valve with an extended stem. This controls a 15-inch cast iron outlet pipe which exits through the spillway wall at elevation 252.7. There is also an 8-inch service water pipe which passes through a valve chamber near the toe of the dam and supplies water to the manufacturing plant. In addition, there is a non-functional outlet at elevation 263.4 which formerly supplied water to a small hydroelectric facility at the plant. This is the only outlet which is not in working condition.

Figure 1, located in Appendix B, shows the plan of the dam and its appurtenant structures. Photographs of each structure are shown in Appendix C.

c. Size Classification

The dam's maximum impoundment of 11 acre-feet and height of 27.2 feet places it in the SMALL category, using as a reference the size classification table in the Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams. Table 1 defines a small impoundment as having a height of 25 to 40 feet.

d. Hazard Classification

The hazard potential classification for this dam is HIGH using the Corps Guidelines, because of the proximity of the dam to the Risdon Manufacturing Company plant and a four-lane highway. A dam breach

would result in flooding around the plant and highway resulting in a possible loss of more than a few lives. The pre- and post-failure depths of flooding in the channel at the hazard area are estimated to be 1.85 feet and 10.85 feet respectively.

e. Ownership

The dam is owned by the Risdon Manufacturing Company, 2100 South Main Street, Waterbury, Connecticut. 06700.

f. Operator

The operation of the dam is controlled by the Maintenace Department of the Risdon Manufacturing Company. The maintenace foreman is Ron Bergeron, and the telephone number is 203-757-8381.

g. Purpose of the Dam

The general purpose of the dam is to supply water for the Risdon Manufacturing Company's plant, but the present operations involve minimal use of water.

h. Design and Construction History

There were no design or construction records found for this dam.

i. Normal Operational Procedures

No data was disclosed for maintenance of reservoir water levels.

1.3 Pertinent Data

a. Drainage Area

The drainage area for this dam covers 1.27 square miles, or 813 acres. Risdon Pond is fed by the water of Hopeville Pond Brook which runs out of Pritchards Pond approximately three-quarters of a mile to the northeast. The brook also picks up drainage from a swampy area south of the pond and from streets in the Hopeville residential area. Elevations in the watershed vary between 275 and 800 NGVD. Hopeville is a well populated district. Downstream of the dam the channel passes under the plant and South Main Street, and flows into the Naugatuck River.

b. Discharge at Damsite

1. The outlet works for the pond consists of a 15-inch cast iron pipe exiting beneath the spillway at elevation 252.7 and an 8" pipe exiting at elevation 254.7, providing service water to the plant. There is also

a non-functional outlet which formerly supplied water to a small hydroelectric facility at the plant. See plan in Appendix B.

2. There are no records of maximum discharge at the dam site. However, the owner reports maximum high water levels have overtopped the dam on several occasions.

3. The ungated spillway capacity with a water surface at the top of dam elevation of 277.9 is approximately 220 cfs.

4. The ungated spillway capacity at test flood elevation of 279.9 is 1420 cfs.

5. The gated spillway capacity at normal pool elevation of 276.2 is not applicable.

6. The gated spillway capacity at test flood elevation of 281.1 is not applicable.

7. The total spillway capacity at test flood elevation of 279.9 is 1420 cfs.

8. The total project discharge at top of dam elevation of 277.9 is 220 cfs.

9. The total project discharge at test flood elevation of 279.9 is 1420 cfs.

c. Elevation (Feet above NGVD)

1. Streambed at centerline of dam	250.7
2. Maximum tailwater	N/A
3. Normal pool	276.2
4. Full flood control pool	N/A
5. Spillway crest	276.2
6. Design surcharge	N/A
7. Top of dam	277.9
8. Test flood surcharge	281.1

d. Reservoir (Length in feet)

1. Maximum pool	500
2. Normal pool	325
3. Flood control pool	N/A

e. Storage (Acre-feet)

1. Normal pool	8.5
2. Spillway crest pool	8.5
3. Flood control pool	N/A
4. Top of dam	11.3
5. Test flood pool	17.7

f. Reservoir Surface (Acres)

1. Normal pool	1.0
2. Flood control pool	N/A
3. Spillway crest pool	1.0
4. Test flood pool	2.0
5. Top of dam	2.0

g. Dam

1. Type	Rubble Masonry
2. Length	150 feet
3. Height	27.2 feet
4. Top width	15.5 - 24.0 feet
5. Side slopes - Upstream	1 vertical to 5 horizontal
Downstream	Vertical
6. Zoning	Unknown
7. Impervious core	Unknown
8. Cutoff	Unknown
9. Grout curtain	Unknown

h. Diversion and Regulating Tunnel

None

i. Spillway

1. Type	Concrete cap on rubble masonry
2. Length of weir	28 feet
3. Crest elevation	276
4. Gate	None
5. Upstream Channel	Under Water
6. Downstream channel	Hand placed cobbles with stone masonry training walls

j. Regulating Outlets

1. Inverts	252.7 (15-inch) 254.7 (8-inch) 263.4 (Non-functional pipe)
2. Size	15-inch Cast Iron Pipe 8-inch Service Water Pipe
3. Description	The wooden platform houses an intake valve which controls the 15-inch outlet which exits through the spillway wall. The 8-inch service water pipe passes through a valve chamber near the toe of the dam (See B-1 for location).
4. Control Mechanism	For the 15-inch pipe there is a valve located in the gate-house. The flow from the 8-inch pipe is controlled by a valve in a concrete chamber at the right spillway toe of the dam.

SECTION 2
ENGINEERING DATA

2.1 Design Data

This dam was constructed in 1890 for service water and power purposes. No plans or in-depth engineering data were found.

2.2 Construction Data

No construction records were available for use in evaluating the dam.

2.3 Operation Data

No engineering operational data were disclosed.

2.4 Evaluation of Data

a. Availability

No engineering data was found to be available for this dam.

b. Adequacy

The lack of in-depth engineering data did not allow for a definitive review. Therefore, the condition of this dam could not be assessed from the standpoint of reviewing design and construction data, but is based primarily on visual inspection, past performance history and sound engineering judgment.

c. Validity

Non-Applicable.

SECTION 3
VISUAL INSPECTION

3.1 Findings

a. General

The field inspection of Risdon Pond Dam was made on December 3, 1980. The inspection team consisted of personnel from Philip W. Genovese & Associates, Inc., Geotechnical Engineers, Inc., and Diversified Technologies, Inc. Mr. Ron Bergeron of Risdon Manufacturing Company was also present during portions of the inspection. Inspection checklists, completed during the visual inspection, are included in Appendix A. At the time of the inspection, the water level was approximately 0.17 feet above the permanent spillway elevation. Water was passing over the spillway. The upstream face of the dam could only be inspected above this water level.

b. Dam

The dam is an earthen embankment with a vertical stone masonry wall along the downstream side for most of the length of the dam. There is a 28 foot long spillway located near the center of the dam at elevation 276.2.

The crest is generally covered with grasses and moderately dense brush up to 7 feet high (Photo No. 9). Five tree stumps ranging in diameter from 6 to 30-inches were located along the upstream and downstream edges of the 20 foot wide crest. A footpath about 1 foot wide follows the approximate centerline of the crest along the earth embankment sections on either side of the spillway. Minor erosion was observed along the right side of the wooden outlet platform. Minor undulations were observed on the crest surface.

The upstream edge of the crest of the dam has been eroded by wave action to form a steep to near vertical face up to a maximum height of 2 feet. The majority of the upstream face of the dam was underwater but appears to slope out into the pond at about 5:1 from the base of the oversteepened edge of the crest. The upstream face consists of earth materials with no riprap or any other wave erosion protection.

The downstream face consists of a vertical stone masonry wall composed of rough cut, crudely rectangular blocks two rows deep (Photos Nos. 3, 4, 7 and 12). Each row is about 2 1/2 feet thick and the face of the blocks averages about 2 feet by 3 feet. The mortar between the blocks is cracked and loose and appears to be completely absent in many locations along

the downstream face of the wall. The entire section of the downstream wall adjacent to the right side of the spillway is unmortared and appears to be loose. At the mid-height of this section the wall bulges out about 6 inches in the downstream direction.

Several blocks in the wall, left of the spillway, have been displaced downstream by as much as 6 inches from the vertical plane of the wall. One block about 3 x 3 x 3 feet has slid out completely from the base of the wall on the left side of the spillway leaving a gap 45 inches x 36 inches deep (Photo No. 10). Several other blocks up to 1 x 3 x 3 feet deep have slid out leaving similar gaps in the downstream wall on either side of the spillway (Photo No. 12). Grasses and moss are growing in many of these gaps and in places where the mortar is cracked, loose or absent (Photo No. 8). One 12-inch diameter tree cluster was observed growing from between several blocks about 2 feet down from the top of the stone wall just to the left of the spillway (Photo No, 11). A 10-inch diameter tree is growing immediately downstream from the base of the wall about 3 feet from the left end.

Seepage was observed between many blocks along the downstream wall on both sides of the spillway. This seepage zone begins about 12 feet below the top of the wall and extends from 10 feet right of the right side of the spillway to 26 feet left of the left side of the spillway. The seepage contained bright orange, presumably organic, matter which stains the wall in several places but does not contain any suspended soil fines (Photo No. 6). No quantity of flow could be estimated.

A depression about 5 x 5 x 3 feet deep was observed at the intersection of the toe of the left wall with a downstream retaining wall 41 feet from the left side of the spillway. Seepage into this depression is clear with no evidence of suspended fines (Photo No. 5). Seepage has formed a shallow pond in the depression and caused some local orange staining. (See B-1 for the location of this depression).

The right abutment appears to be in generally good condition with only minor brush and grass growing on the surface (Photo No. 4). Several trees and saplings are growing on the left abutment and along the left bank. A 12-inch diameter culvert enters the upstream side of the left abutment from a parking lot adjacent to the dam. Runoff through the culvert has created a minor erosion path down to the pond. This path consists of generally loose natural earth materials with scattered patches of moss and gravel, occasional cobbles and boulders. Some leaves and branches lie in the path which was dry at the time of inspection.

c. Appurtenant Structures

The spillway is about 27 feet wide and consists of a concrete floor

slab with stone and mortar training walls 18 to 24 inches high (Photo No.1). The floor slab and training walls are in generally good condition; however, some stones are missing from the left training wall. Minor debris, including leaves, branches, and wood has accumulated on the left side of the crest of the spillway.

A gate structure about 15 feet long and 12 feet across is located on the upstream side of the crest near the right side of the spillway. This platform houses the control mechanism associated with the 15-inch cast iron outlet pipe. Minor erosion has occurred between the gate structure and the right spillway training wall. The platform itself is covered with roofing material and appears to be in good condition. The supporting members were not visible.

d. Reservoir Area

There was extensive development upstream of the reservoir and abutting it. A public road crosses the reservoir at the eastern end of it, and there are parking lots on the north and south sides of it. A 12-inch storm drain enters the reservoir from the parking lot on the south side.

e. Downstream Channel

The downstream channel floor is lined with hand-placed cobbles and boulders. About 50 feet downstream from the dam the cobble liner is loose and some cobbles appear to have washed downstream. Although the liner surface is uneven and some stones are missing, it appears that a second layer of cobbles protects the floor of the channel from erosion.

The sidewalls of the downstream channel are composed of stone and mortar. Both the left wall (2 to 4 feet high) and the right wall (3 to 7 feet high) appear to be in good condition (Photo No. 1 and 2). The downstream channel extends from the bottom of the spillway to a culvert which carries the stream under the Risdon plant and the highway. The stream then flows into the Naugatuck River.

3.2 Evaluation

Based on the visual inspection, the dam appears to be in fair condition. The inspection disclosed the following items which require attention:

a. Trees and brush are growing on the crest of the dam, on the abutments, and near the toe of the downstream face.

b. Five tree stumps up to 30-inches in diameter appear along the crest of the dam.

c. There is a footpath about 1 foot wide along the crest of the dam.

d. The upstream edge of the crest has been eroded by wave action and has no protection against erosion.

e. Mortar between the blocks in the stone masonry wall forming the downstream face of the dam is cracked, loose or absent in many places.

f. Many of the blocks in the downstream wall have been displaced as much as 6 inches downstream, and some have fallen out completely, leaving gaps up to 45inches x 36 inches x 36 inches.

g. Grasses, moss and one tree cluster grow in the joints between the stones of the wall forming the downstream face.

h. Seepage is occurring through many of the joints between the stones of the downstream wall.

i. Water is seeping into and ponding in a moderately deep depression adjacent to the base of the downstream wall.

j. Stones are missing from the left spillway training wall.

k. Minor debris has accumulated on the spillway crest.

l. The hand-placed cobbles forming the floor of the downstream channel have been loosened and washed downstream, beginning about 50 feet downstream from the dam.

SECTION 4
OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 Operational Procedures

a. General

The dam creates an impoundment of the water which is used primarily for service water purposes.

b. Description of any Warning System in Effect

There are no known warning systems in effect at this facility.

4.2 Maintenance Procedures

a. General

There is no annual maintenance schedule for Risdon Pond Dam, although periodic maintenance is performed on an infrequent basis.

b. Operating Facilities:

Maintenance work on the operating facilities is done infrequently, there being no established routine.

4.3 Evaluation

The current maintenance procedures for the dam are inadequate. A formal downstream warning system should be developed and put into effect in case of an emergency at the dam. Also, a program of annual technical inspections by qualified registered engineers should be instituted.

SECTION 5
EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 General

The Risdon Pond Dam has a tributary watershed of 1.27 square miles of rolling terrain, the majority of which is highly developed for residential use. The watershed elevations range between a low 276 NGVD and 810 NGVD. Pritchards Pond and Hills Pond No. 1 and No. 2 are within this tributary area.

The dam is basically a high spillage type of project with insignificant surcharge storage capability. It has a water surface area and storage area at spillway level (El. 276 NGVD) of 1 acre and 8.5 acre-feet respectively. The maximum impoundment to the top of dam (El. 277.9 NGVD) is estimated to be 11 acre-feet. The dam is classified as a small dam with a high hazard potential.

5.2 Design Data

No hydraulic or hydrologic design data could be found for this dam.

5.3 Experience Data

The maximum discharge at this dam site is unknown and no information was found to indicate that there have been any serious problems arising at the dam. However, it has been reported that the main floor of the Risdon Manufacturing Company, located 150± feet downstream of the dam, has experienced flooding during the heavy rains of July 1980 at which time the entire length of the dam was overtopped. During the August 1955 hurricane a flooding of 2± feet in the building was reported.

5.4 Test Flood Analysis

Based upon the U.S. Army Corps of Engineers, March 1977 Guide Curves for Estimating Maximum Probable Flood Peak Flow Rates for a rolling watershed classification with 1.27 square miles watershed area, a PMF of 2860 cfs or 2250 cfs per square mile is estimated at the dam site. In accordance with Table 3 of Corps of Engineers' Recommended Guidelines, the range of test flood to be considered is from the 1/2 PMF to the PMF for a small size dam with high hazard classification. Based upon the hazard potential associated with a breach of the dam, the test flood for Risdon Pond Dam is selected as equivalent to 1/2 PMF. The pond level at the start of the test flood is considered to be at elevation 276.0, which is at the spillway crest. Peak inflow to the reservoir at

the test flood is 1430 cfs; peak outflow is 1420 cfs with the dam overtopped by 1.95 feet, The maximum surcharge height above spillway crest is estimated to be 3.85 feet. Based upon the hydraulic computation, the spillway capacity to the top of dam is 220 cfs which is equivalent to 16% of the routed test flood outflow (Appendix D-7).

Hydraulic computations were also performed for a peak flood equivalent to PMF (Appendix D-10).

5,5 Dam Failure Analysis

Utilizing the Corps of Engineers April 1978 "Rule of Thumb Guidance for Estimating Downstream Failure Hydrographs", the peak failure outflow due to dam breach is estimated to be 8400 cfs with an estimated flood depth of 12 feet immediately downstream of the dam. The flood routing was performed for peak failure outflow with pool at top of dam. The prefailure flow in the downstream channel is estimated to be 220 cfs with a depth of flow of 1.3 feet and flood stage is estimated to increase by 8.4 feet at the impact area (Risdon Co.) located 150± feet downstream of the dam.

The estimated peak flow rates and peak flood depths downstream of the dam resulting from a dam failure are:

Impact Area	Flow (CFS)	Flood Depth (Feet)	Velocity (FPS)
Risdon Co.	8000	9.7	28

Immediately below the channel reach analyzed, Risdon Company's large manufacturing building is located. The elevation of the main floor is 249± NGVD and the channel with an elevation of 244.75 NGVD flows underneath this floor. Thus, this facility located directly in the path of peak failure outflow would be subjected to severe flooding with 6± feet of water flowing with a very high velocity of 28 fps. This manufacturing facility operates in 2 shifts per day employing 120 people, therefore, loss of more than a few lives is considered likely. Also, the conduits beneath the building carrying the outflow are estimated to have a capacity of only 400 cfs and therefore are grossly inadequate for the peak failure outflow. In addition, a heavily traveled 4-land road adjacent to the building could be subjected to severe flooding.

The Risdon Pond Dam, therefore is classified as "high" hazard potential. This conclusion is based upon Hydraulic/Hydrologic Analysis included in the Appendix D which also summarizes Hydraulic/Hydrologic Computations (D-17).

SECTION 6
EVALUATION OF STRUCTURAL STABILITY

6.1 Visual Observations

The visual inspection did not disclose any immediate stability problems, and there was no evidence of damage from overtopping. However, the trees growing on the abutments, adjacent to the downstream wall, and out of the downstream wall, along with continued deterioration of and seepage through the stone masonry downstream face could affect the long-term performance of the dam.

6.2 Design and Construction Data

No information was available concerning the type of soil in the earth embankment and foundation conditions. Thus, the evaluation of stability is based solely on visual inspection.

6.3 Post-Construction Changes

No information is available regarding post-construction changes.

6.4 Seismic Stability

The Risdon Pond Dam is located in Seismic Zone No. 1 and in accordance with the Corps of Engineers' guidelines, does not warrant further seismic analysis at this time.

SECTION 7
ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition

Based on a visual inspection, the dam appears to be in fair condition as evidenced by the features discussed in Section 3.2.

b. Adequacy of Information

The lack of in-depth engineering data did not allow for a definitive review. Therefore, the safety of the dam with respect to soils, geology and geotechnical engineering is based on visual inspection.

c. Urgency

The recommendations and remedial measures described below should be implemented by the owner within one year after he receives this Phase I Inspection Report.

7.2 Recommendations

It is recommended that the Owner employ a qualified registered engineer to:

1. Investigate the sources and paths of seepage through the joints of the stone masonry wall forming the downstream face to determine the potential effects of seepage on the stability of the dam.

2. Cut all brush and trees growing on the crest and abutments, between the blocks of the downstream face and adjacent to the toe of the downstream face. Remove all stumps and roots and fill with proper backfill materials.

3. Reset all loose and displaced blocks in the stone wall forming the downstream face and the spillway wall and fill any gaps due to fallen-out blocks with proper sized stone.

4. Investigate the cause of missing and disloged masonry on the downstream wall, spillway training walls, and downstream channel walls and recommend appropriate corrective measures.

5. Inspect the downstream face of the spillway under no-flow conditions.

6. Repair the areas of erosion along the upstream edge of the crest and protect the upstream face from wave erosion using properly engineered and placed riprap.

7. Investigate the hydrology and hydraulics associated with the dam to assess further the potential of overtopping the dam and the need for and the means to increase project discharge capacity.

7.3 Remedial Measures

a. Operations and Maintenance Procedures

1. Prevent brush and trees from growing on the crest, abutments, upstream face and downstream wall.

2. Keep the spillway channel clear of debris.

3. Institute a program of annual technical inspections by qualified, registered engineers.

4. Repair the crest along the area of the footpath.

5. Repair the downstream channel where there are missing cobbles.

6. Initiate a surveillance program for use during and immediately after heavy rainfall and a downstream warning program to follow in case of an emergency at the dam.

7.4 Alternatives

There are no practical alternatives to the recommendations of Sections 7.2 and 7.3.

APPENDIX A

INSPECTION CHECKLIST

VISUAL INSPECTION CHECK LIST
PARTY ORGANIZATION

PROJECT RISDON POND DAM

DATE December 3, 1980

TIME 11:30 A.M. - 1:30 P.M.

WEATHER Clear, 35° F

W.S. ELEV. _____ U.S. _____ DN.S.

PARTY:

1. Walter Gancarz - Genovese
2. Mark Ballou - Genovese
3. Murali Atluru - Diversificed Tech. Corp.
4. Richard F. Murdock - Geotechnical Engineers, Inc.
5. Richard W. Turnbull - Geotechnical Engineers, Inc.
6. _____
7. _____

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.	Embankment	GEI	
2.	Outlet Works	Genovese	
3.	Spillway	DTC	
4.			
5.			
6.			
7.			
8.			
9.			
10.			

PERIODIC INSPECTION CHECK LIST

PROJECT Risdon Pond Dam DATE December 3, 1980

PROJECT FEATURE Dam Embankment NAME

DISCIPLINE Geotechnical NAME Murdock/Turnbull

AREA EVALUATED	CONDITIONS
DAM EMBANKMENT	
Crest Elevation	277.9
Current Pool Elevation	276.3
Maximum Impoundment to Date	
Surface Cracks	None observed
Pavement Condition	No pavement
Movement or Settlement of Crest	Minor undulations
Lateral Movement	None observed
Vertical Alignment	Some blocks displaced up to 6 inches downstream direction in downstream face adjacent to right and left sides of spillway.
Horizontal Alignment	General bulge downstream on either side of spillway.
Condition at Abutment and at Concrete Structures	Minor erosion along right side of gate-house on crest.
Indications of Movement of Structural Items on Slopes	Some blocks in masonry wall have fallen out completely, some displaced up to 6 inches.
Trespassing on Slopes	A footpath about 1 foot wide along approximate centerline of crest.
Sloughing or Erosion of Slopes or Abutments	Minor erosion of left abutment where 12 inch diameter culvert allows runoff to enter pond from a parking lot upstream of the dam.
Rock Slope Protection - Riprap Failures	None observed.

PERIODIC INSPECTION CHECKLIST

PROJECT Risdon Pond Dam DATE December 3, 1980

PROJECT FEATURE Dam Embankment NAME

DISCIPLINE Geotechnical NAME Murdock/Turnbull

AREA EVALUATED	CONDITION
Unusual Movement or Cracking at or near Toes	Some blocks have fallen out about 15 feet from left side of spillway; others displaced to 6 inches.
Unusual Embankment or Downstream Seepage	Abundant seepage from between blocks with cracked or no mortar from 10 feet right side to 6 feet left side of spillway beginning about 12 feet down from crest. Ponding 41 feet from left end of spillway. Bright orange organic efflorescence along some seeps.
Piping or Boils	None observed
Foundation Drainage Features	None observed
Toe Drains	None observed
Instrumentation System	None observed
Vegetation	Crest generally overgrown with brush to 7 feet high weeds and grass; occasional stumps to 21 inch diameter.

PERIODIC INSPECTION CHECK LIST

PROJECT RISDON POND DAM DATE December 3, 1980

PROJECT FEATURE Dike Embankment NAME

DISCIPLINE Geotechnical NAME Murdock/Turnbull

AREA EVALUATED	CONDITION
DIKE EMBANKMENT	
Crest Elevation	No dike embankment
Current Pool Elevation	
Maximum Impoundment to Date	
Surface Cracks	
Pavement Condition	
Movement or Settlement of Crest	
Lateral Movement	
Vertical Alignment	
Horizontal Alignment	
Condition at Abutment and at Concrete Structures	
Indications of Movement of Structural Items on Slopes	
Trespassing on Slopes	
Sloughing or Erosion of Slopes or Abutments	
Rock Slope Protection - Riprap Failures	
Unusual Movement or Cracking at or near Toes	
Unusual Embankment or Downstream Seepage	
Piping or Boils	
Foundation Drainage Features	
Toe Drains	
Instrumentation System	
Vegetation	

PERIODIC INSPECTION CHECK LIST

PROJECT RISDON POND DAM DATE December 3, 1980

PROJECT FEATURE Outlet Works - Intake NAME

DISCIPLINE Geotechnical/Civil/Hydraulic NAME Murdock/Turnbull/Gancarz/Ballou/Atluru

AREA EVALUATED	CONDITION
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	Not visible (under water).
a. Approach Channel	
Slope Conditions	
Bottom Conditions	
Rock Slides or Falls	
Log Boom	
Debris	
Condition of Concrete Lining	
Drains or Weep Holes	
b. Intake Structure	
Condition of Concrete	
Stop Logs and Slots	

PERIODIC INSPECTION CHECK LIST

PROJECT RISDON POND DAM DATE December 3, 1980

PROJECT FEATURE Outlet Works - Control Tower NAME

DISCIPLINE Hydraulics/Civil NAME Atluru/Gancarz/Ballou

AREA EVALUATED	CONDITION
OUTLET WORKS - CONTROL TOWER	None observed.
a. Concrete and Structural	
General Condition	
Condition of Joints	
Spalling	
Visible Reinforcing	
Rusting or Staining of Concrete	
Any Seepage or Efflorescence	
Joint Alignment	
Unusual Seepage or Leaks in Gate Chamber	
Cracks	
Rusting or Corrosion of Steel	
b. Mechanical and Electrical	
Air Vents	
Float Wells	
Crane Hoist	
Elevator	
Hydraulic System	
Service Gates	
Emergency Gates	
Lightning Protection System	
Emergency Power System	
Wiring and Lighting System	

PERIODIC INSPECTION CHECK LIST

PROJECT RISDON POND DAM DATE December 3, 1980

PROJECT FEATURE Outlet Works - Conduit NAME

DISCIPLINE Hydraulics/Structural NAME Atluru/Gancarz/Ballou

AREA EVALUATED	CONDITION
OUTLET WORKS - TRANSITION AND CONDUIT	Not visible.
General Condition of Concrete	
Rust or Staining on Concrete	
Spalling	
Erosion or Cavitation	
Cracking	
Alignment of Monoliths	
Alignment of Joints	
Numbering of Monoliths	

PERIODIC INSPECTION CHECK LIST

PROJECT RIDSON POND DAM DATE December 3, 1980

PROJECT FEATURE Outlet Works Structure and Channel NAME

DISCIPLINE Structural/Hydraulics/Geotechnical NAME Gancarz/Atluru/Murdock

AREA EVALUATED	CONDITION
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	None.
General Condition of Concrete	
Rust or Staining	
Spalling	
Erosion or Cavitation	
Visible Reinforcing	
Any Seepage or Efflorescence	
Condition at Joints	
Drain holes	
Channel	
Loose Rock or Trees Overhanging Channel	
Condition of Discharge Channel	

PERIODIC INSPECTION CHECK LIST

PROJECT RISDON POND DAM DATE December 3, 1980

PROJECT FEATURE Outlet Works - Spillway NAME

DISCIPLINE Geotechnical/Civil/Structural NAME Murdock/Turnbull/Gancarz

	AREA EVALUATED	CONDITION
	OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
	a. Approach Channel	
GEI	General Condition	Good.
GEI	Loose Rock Overhanging Channel	Two rocks in channel wall had fallen out.
GEI	Trees Overhanging Channel	None.
GEI	Floor of Approach Channel	Clear.
	b. Weir and Training Walls	Stone masonry training walls.
	General Condition of Concrete	Good.
	Rust or Staining	No.
	Spalling	Yes.
	Any Visible Reinforcing	No.
	Any Seepage or Efflorescence	No.
GEI	Drain Holes	None observed.
	c. Discharge Channel	
GEI	General Condition	Good to fair.
GEI	Loose Rock Overhanging Channel	Minor loose blocks.
GEI	Trees Overhanging Channel	None observed.
GEI	Floor of Channel	Some hand-placed cobbles washed out.
GEI	Other Obstructions	Generally clear.

PERIODIC INSPECTION CHECK LIST

PROJECT RISDON POND DAM — DATE December 3, 1980

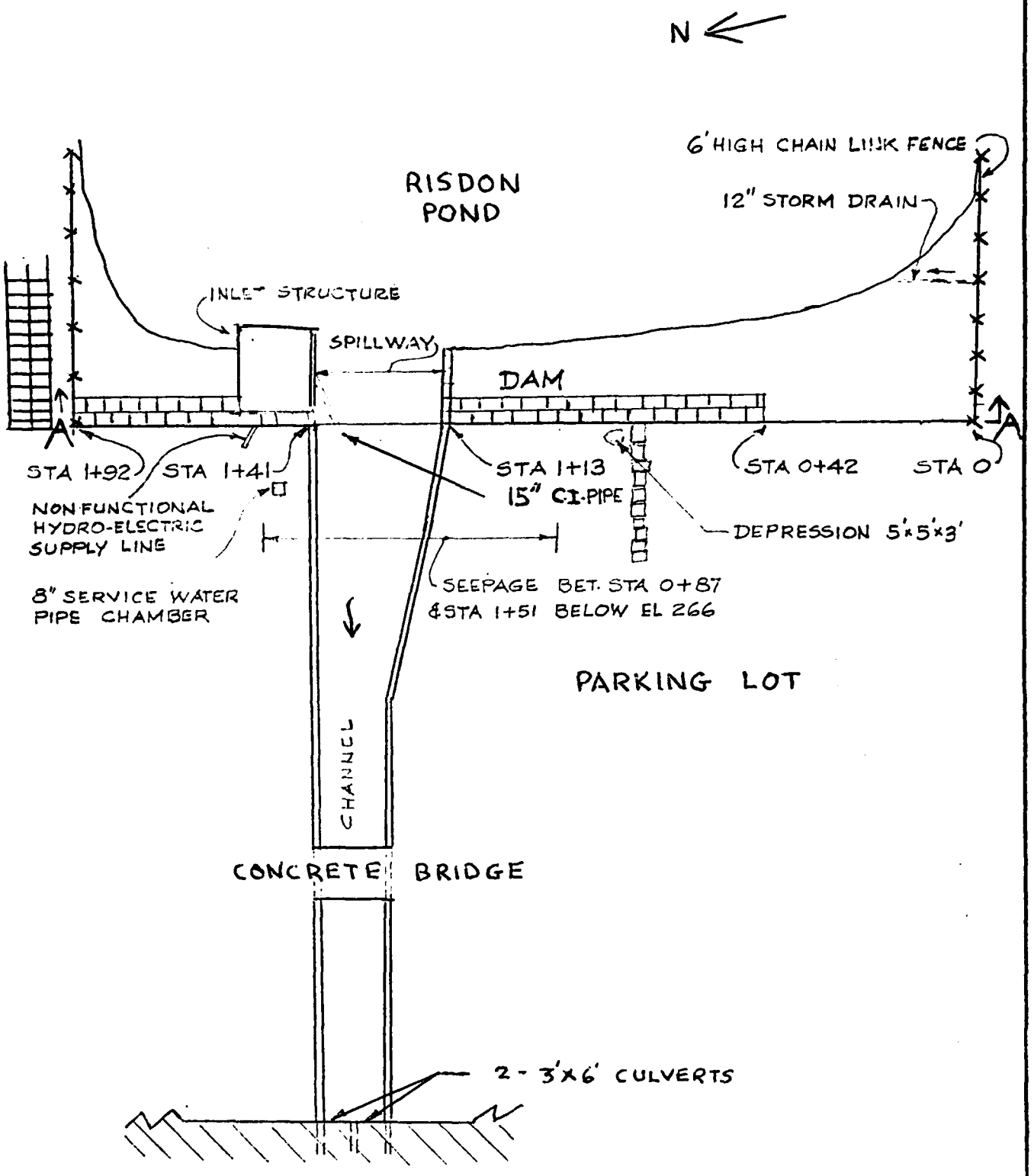
PROJECT FEATURE Outlet Works - Bridge — NAME

DISCIPLINE Civil/Structural — NAME Gancarz

AREA EVALUATED	CONDITION
OUTLET WORKS - SERVICE BRIDGE	
a. Super Structure	10 feet x 15 feet wooden structure set in stone masonry.
Bearings	Good.
Anchor Bolts	None Visible.
Bridge Seat	Good.
Longitudinal Members	Some cracking, displacement.
Under Side of Deck	Not visible.
Secondary Bracing	
Deck	Asbestos roofing material - good.
Drainage System	N/A
Railings	None.
Expansion Joints	None.
Paint	None.
b. Abutment & Piers	
General Condition of Masonry	Good.
Alignment of Abutment	Good.
Approach to Bridge	Heavy vegetation.
Condition of Seat & Backwall	Good.

APPENDIX B

ENGINEERING DATA



RISDON MFG. CO.

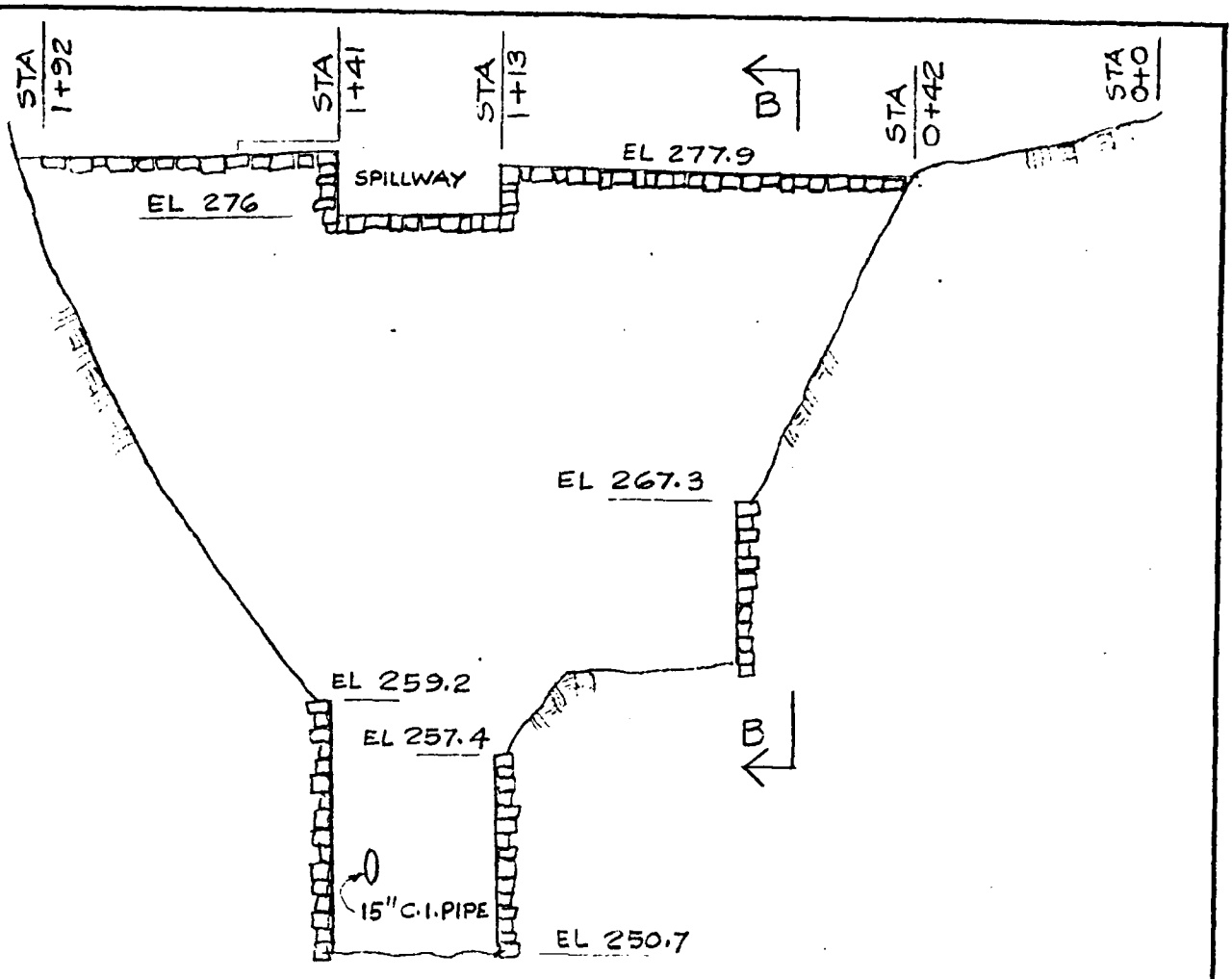
PLAN

1" = 30'

0 30 60 FT

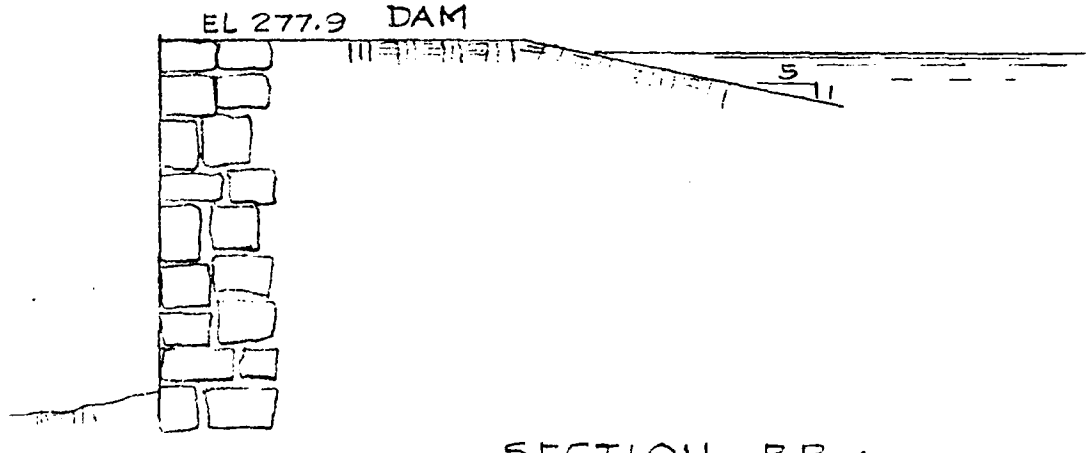
SCALE

PHILIP W. GENOVESE & ASSOCIATES, INC. ENGINEERS HAMDEN, CONNECTICUT	RISDON POND DAM (CT00176)



SECTION AA

HOR 1"=30', VER 1"=6'



SECTION BB (STA 0+66)

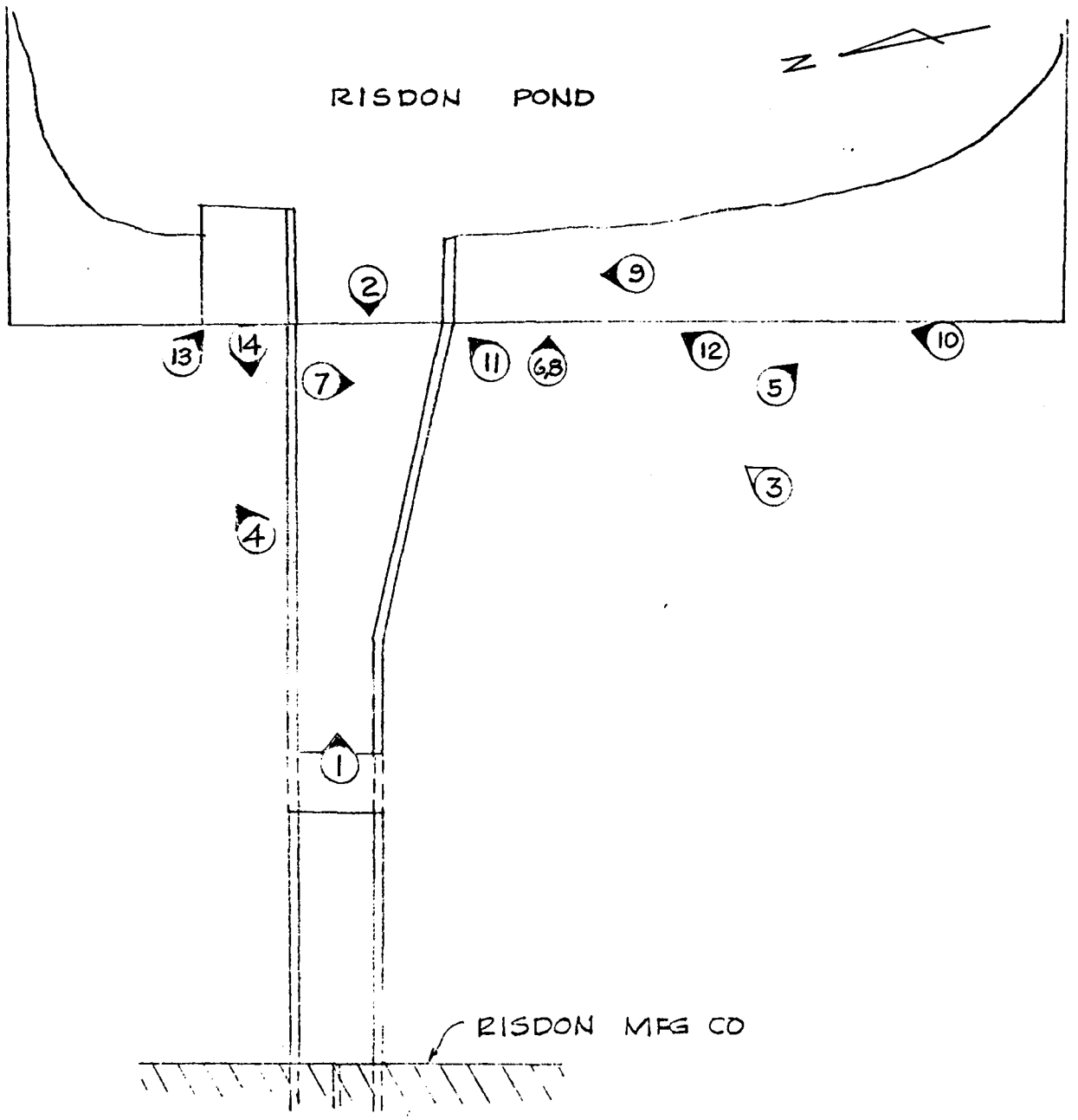
1"=10'

0 30' 60'
0 10' 20'
0 6' 12'
SCALE IN FEET

PHILIP W. GENOVESE & ASSOCIATES, INC. ENGINEERS HAMDEN, CONNECTICUT	RISDON POND DAM (CT00176)

APPENDIX C

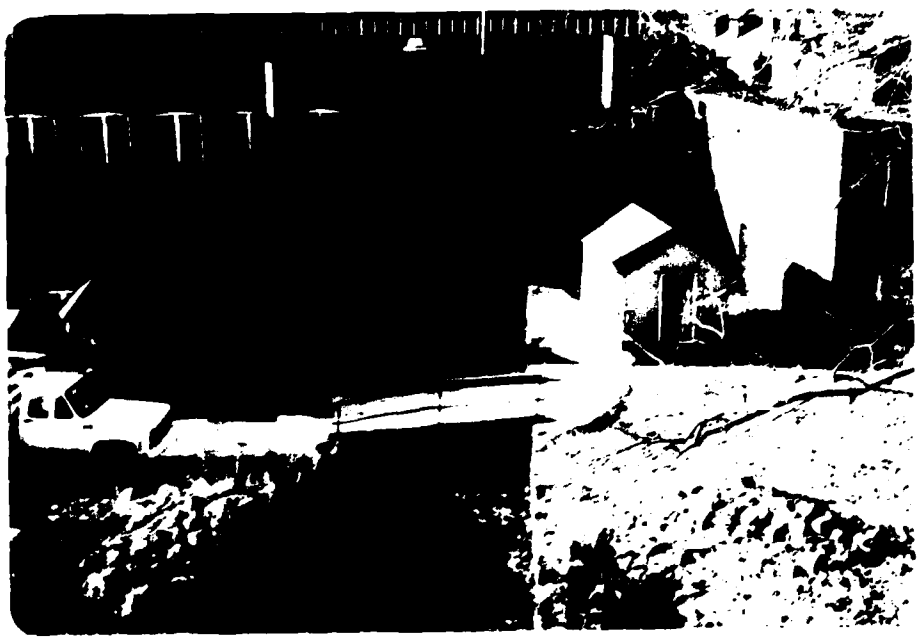
PHOTOGRAPHS



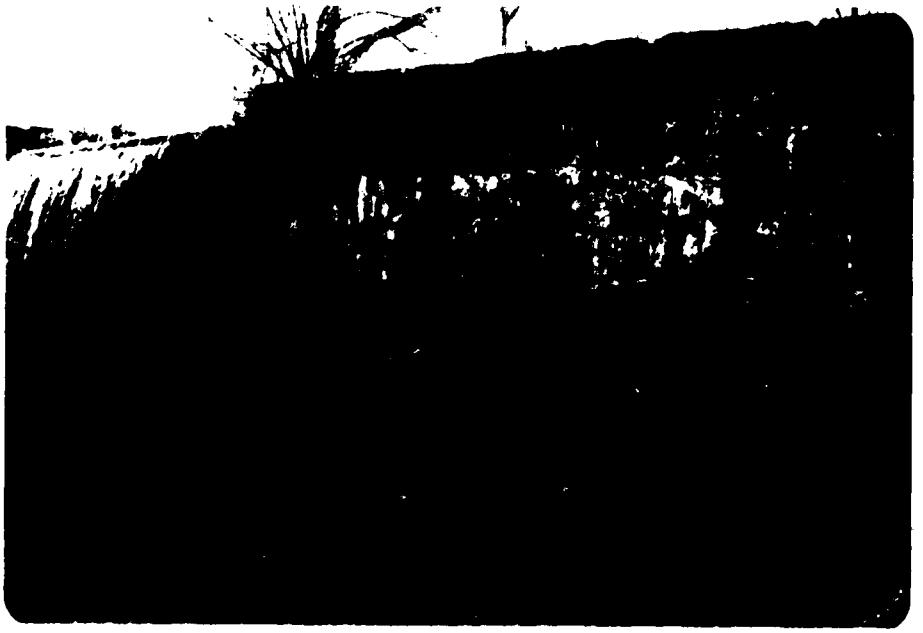
(3) REFERS TO PHOTO NUMBER, LOCATION AND DIRECTION

U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.	NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS	PHOTO LOCATION PLAN
PHILIP W. GENOVESE AND ASSOCIATES, INC. ENGINEERS - HAMDEN, CT.		RISDON POND DAM HOPEVILLE POND BROOK WATERBURY, CONNECTICUT

1. Looking upstream at spillway.



2. Looking downstream from right side of spillway.



3. Photo of downstream wall on left side.

4. Photo of downstream wall on right side.

5. Seepage at toe of dam at corner with right angle wall, clear, no evidence of piping, standing water, rule extended 3 feet.

6. Seepage along toe of wall to left of spillway channel.

7. Seepage along toe of dam from right side of spillway channel.

8. Loss of grout from downstream left face of dam.

9. Edge of masonry block downstream wall near left side of dam looking toward spillway.

10. Displaced block (3' x 3') at base of wall 20' to right of spillway channel.

11. Tree growing out of dam just to the left of the spillway.

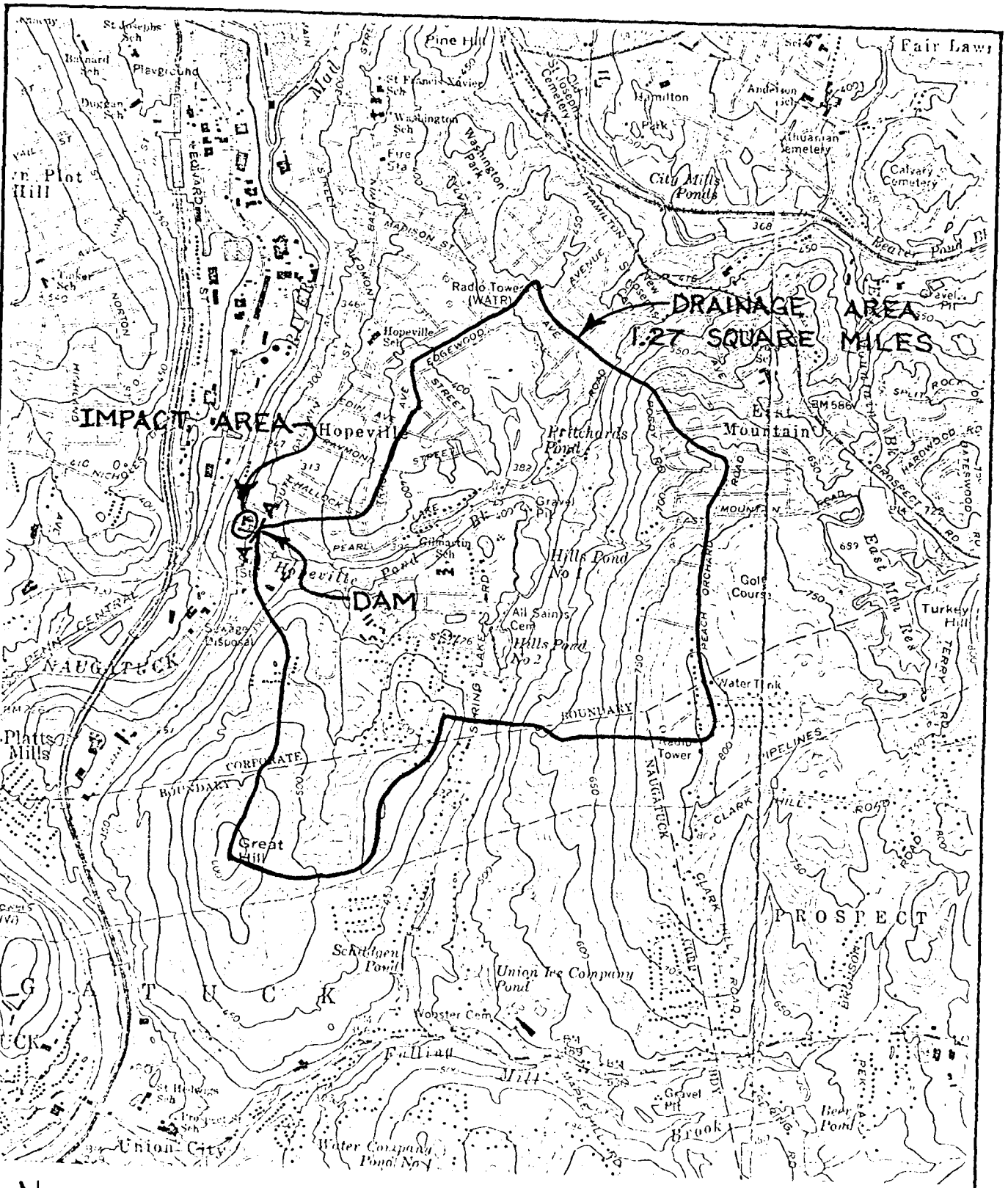
12. Photo of rotated block on left side of downstream wall.

13. Outlet Control works for 15" cast iron pipe.

14. Non-operable pressure outlet located to the right of the spillway.

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS



DRAINAGE & IMPACT AREA

WATERBURY QUAD

DRAINAGE AREA = 1.27 SQ.M.

PHILIP W. GENOVESE & ASSOCIATES, INC. ENGINEERS HAMDEN, CONNECTICUT	RISDON POND DAM (CT00176)

PERFORMANCE AT PEAK FLOOD CONDITIONS

PROBABLE MAXIMUM FLOOD (PMF) DETERMINATION:

DRAINAGE AREA — 1.27 SQ. MI BASED UPON PLANIMETER MEASUREMENTS OF USGS WATERBURY QUAD MAP.

WATERSHED CLASSIFICATION - "ROLLING" BASED UPON USGS MAP AND SITE VISIT.

PMF PEAK INFLOW -
PER CORPS OF ENGINEERS DECEMBER 1977 GUIDANCE CURVE FOR "ROLLING" A PEAK FLOW RATE OF 2250 CFS/SQ. MI IS SELECTED FOR ABOVE CONDITIONS

∴ PMF PEAK INFLOW = 1.27 × 2250 ≅ 2860 CFS

SIZE CLASSIFICATION -
FOR THE PURPOSE OF DETERMINING PROJECT SIZE THE MAXIMUM STORAGE ELEVATION IS CONSIDERED EQUAL TO THE TOP OF DAM

TOP OF DAM = EL. 279.9* NAVD (Lowest Average El.)
TOE OF DAM = EL 252.7
HEIGHT OF DAM = 27.2 FT

* Since the W.S. Elevation is not indicated on the USGS map, the normal W.S. Elevation is assumed to be the same as the spillway crest elevation of 276 obtained from PW Engineers & Assoc. Inc's [illegible] information. The location is assumed to be approximately on National Geodetic Vertical Datum (NGVD) and all other elevations are referenced to this assumed elevation and are obtained based upon information furnished by PW Engineers & Assoc Inc.

PLANIMETERING FROM USGS MAP FOR POND SURFACE AREAS—

AT EL. 276 (SP. CREST) = 1 Ac
AT EL 277.9 (TOP OF DAM) = 2 Ac (ESTIMATION BASED UPON USGS MAP AND FIELD INFORMATION)

A STAGE-POND AREA CURVE IS PLOTTED (SHEET 4)

AVERAGE POND AREA BETWEEN SPILLWAY CREST AND TOP OF DAM = 1.5 Ac.
STORAGE BETWEEN SP.CR & TOP OF DAM = 1.9' × 1.5
≅ 2.8 AC. FT

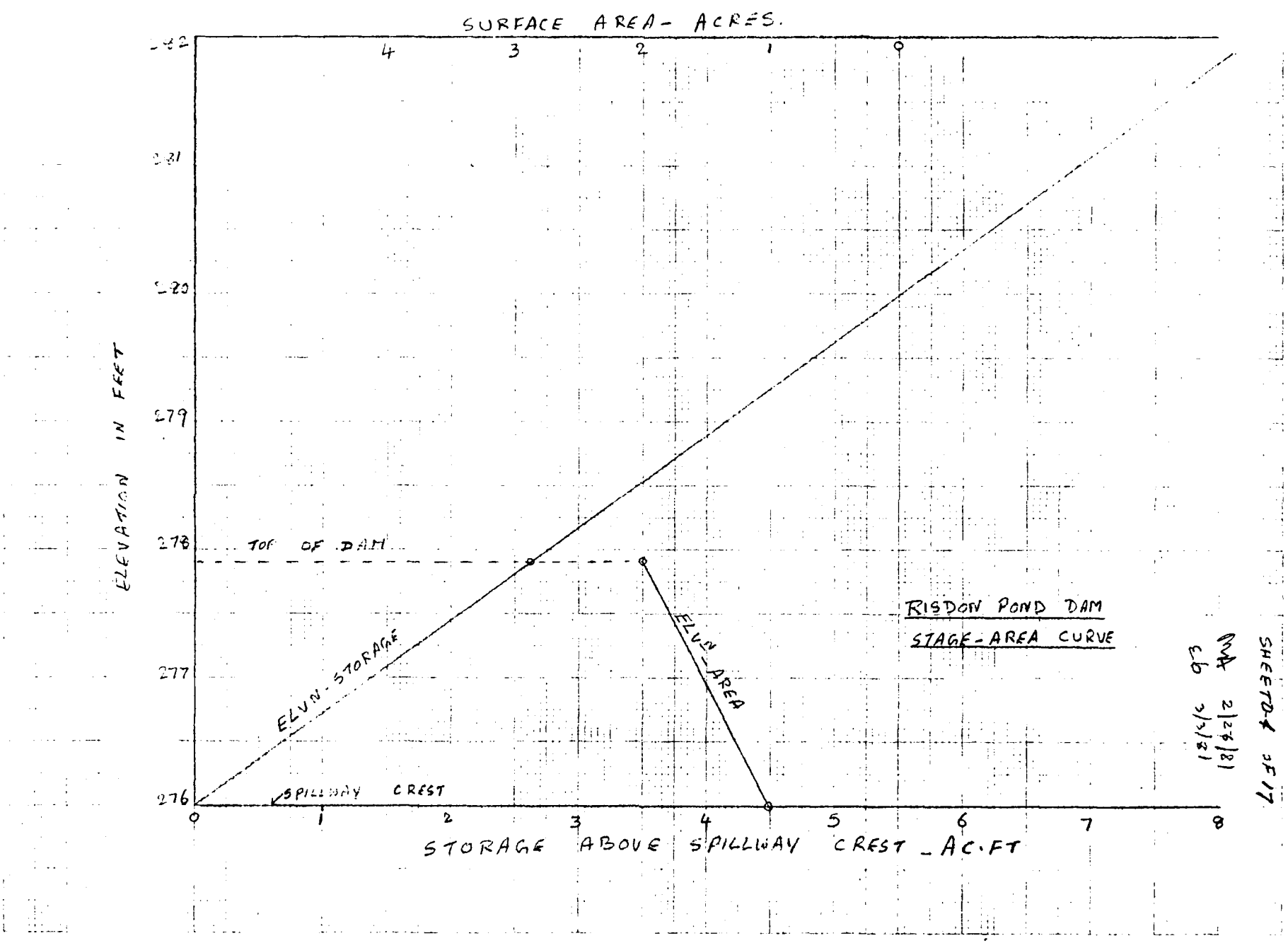
ESTIMATED STORAGE BELOW SP.CR = $\frac{1}{3}bh$

$= \frac{1}{3} \times 1 \times (276 - 250.7)$
$= 8.5$ AC. FT.

∴ MAXIMUM IMPOUNDMENT TO TOP OF DAM ≅ 11 AC. FT.

A STAGE-STORAGE CURVE IS PLOTTED ON SHEET 4.

THUS, ACCORDING TO CORPS OF ENGINEERS GUIDELINES TABLE 1, THE RISDON POND DAM IS CLASSIFIED SMALL BASED UPON THE HEIGHT OF THE DAM OF 27.2 FT (> 25' < 40')


SURFACE AREA - ACRES.
4
3
2
1
0
ELEVATION IN FEET
280
279
278
277
276
TOP OF DAM
ELEV - STORAGE
ELEV - AREA
SPILLWAY CREST
0
1
2
3
4
5
6
7
8
STORAGE ABOVE SPILLWAY CREST - AC.FT
RISDON POND DAM
STAGE - AREA CURVE
DWN 2/26/81
CHD 3/2/81
SHEET 4 OF 17

HAZARD POTENTIAL - HIGH HAZARD POTENTIAL DAM BASED UPON DAM BREACH ANALYSIS AND RELATIVE LOCATION OF THE IMPACT AREAS (RISDON MANUFACTURING CO. AND A HEAVILY TRAVELED 4-LANE ROAD). A DETAILED DISCUSSION OF HAZARD POTENTIAL IS INCLUDED AT THE END OF BREACH ANALYSIS SECTION OF APPENDIX D.

SELECTION OF TEST FLOOD -
FOR THE SMALL SIZE AND HIGH HAZARD POTENTIAL CLASSIFICATION, TABLE 3 OF CORPS OF ENGINEERS RECOMMENDED GUIDELINES, THE TEST FLOOD COULD BE IN THE $\frac{1}{2}$ PMF TO PMF RANGE. BASED UPON THE INVOLVED RISK POTENTIAL DOWNSTREAM OF THE DAM, A TEST FLOOD = $\frac{1}{2}$ PMF IS SELECTED (HIGH END OF THE RANGE)

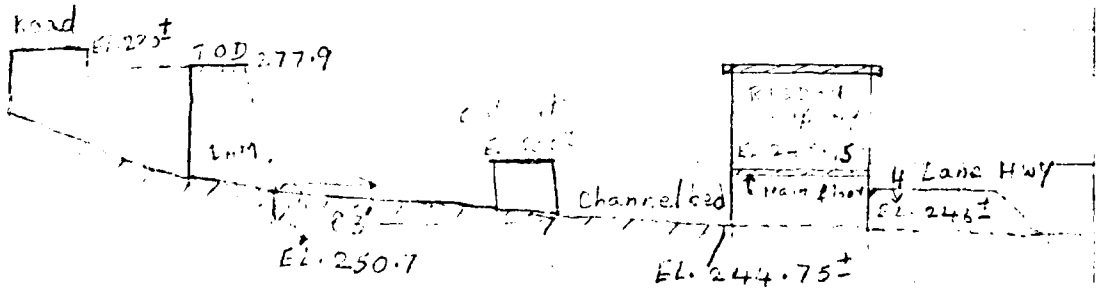
TEST FLOOD PEAK INFLOW = 1430 CFS

$\frac{1}{2}$ PMF WOULD RESULT FROM $9\frac{1}{2}$" RUN-OFF FROM 1.27 sq. MILES OF DRAINAGE AREA.

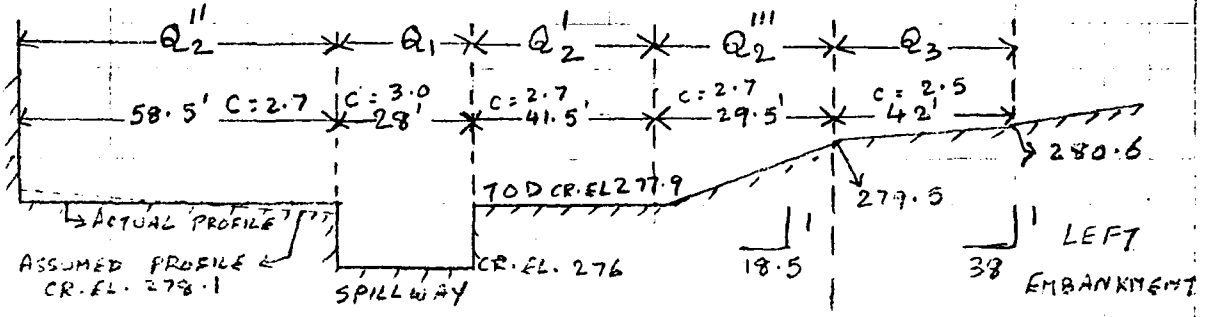
∴ TOTAL STORM VOLUME = $\frac{9\frac{1}{2}"}{12}$ x 1.27 x 640 = 644 AC-FT

THUS, MAXIMUM STORAGE (BETWEEN SPILLWAY CREST AND TOP OF DAM) OF 2.8 AC-FT IS 0.4% OF THIS STORM VOLUME.

SKETCH PROFILE SHOWING RELATIVE ELEVATIONS -



COMPOSITE DISCHARGE RATING CURVE



POTENTIAL OVERFLOW PROFILE

(Based upon P.W. Genovese & Ass. Inc's field information)

SPILLWAY

$Q_1 = CLH^{3/2}$
$= 84H^{3/2}$

C = 3.0 for Broad Crested Weir (stone)
Cr.EL = 276 L = 28'

DAM

$Q_2 = Q_2' + Q_2'' + Q_2'''$

$Q_2' = CLH^{3/2}$
$= 112H^{3/2}$

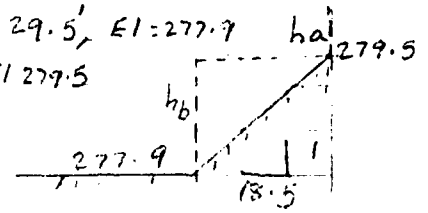
C = 2.7 assumed
Cr.EL = 277.9, L = 41.5'

$Q_2'' = 158H^{3/2}$

C = 2.7, Cr.El = 278.1, L = 58.5'

$Q_2''' = \frac{2}{3} CL \frac{(h_b^{5/2} - h_a^{5/2})}{(h_b - h_a)}$ *

C = 2.7, L = 29.5', El = 277.9 ha
ha = 0 upto El 279.5



* USGS recommended formula for more Precise discharge over inclined Dam/embankment crest (Ref: measurements of Peak discharges at Dam by Indirect Methods, USGS Book 3, chapter A 5, Page 3-4, 1968)

LEFT EMBANKMENT

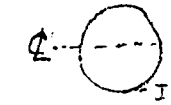
$$Q_3 = \frac{2}{5} CL \frac{(h_b^{5/2} - h_a^{5/2})}{(h_b - h_a)}$$

for $c = 2.5$, $L = 42'$
$EL = 279.5$

OUTLET

$$Q_4 = 0.6 A \sqrt{2gH}$$
$$= 0.6 \times \frac{\pi}{4} (1.25)^2 \sqrt{64.4 \times 24.6}$$
$$\cong 30 \text{ CFS}$$

Diameter of CIP = 15"

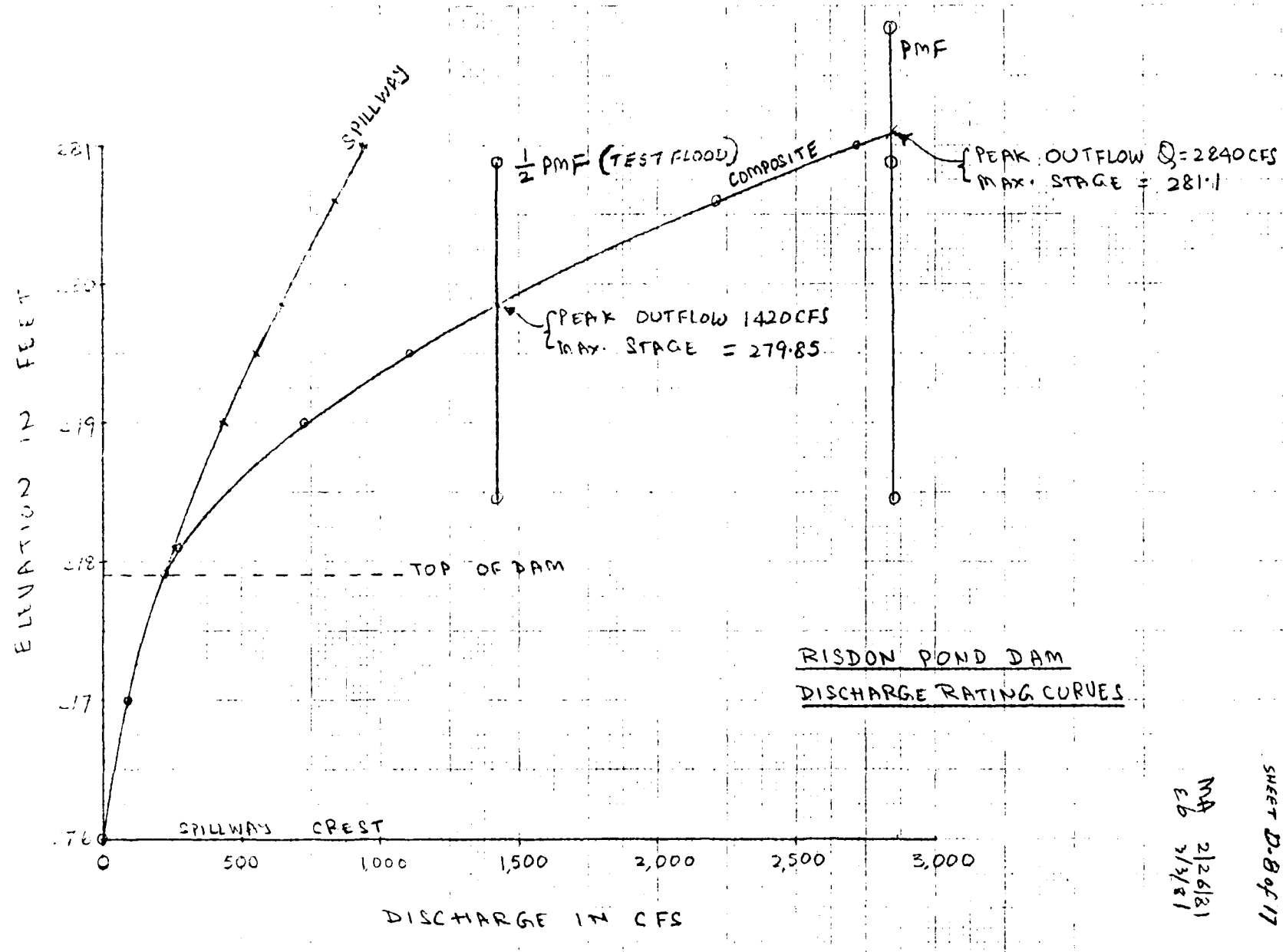


H = 24.6 with pool at top of dam

TABULATION OF DISCHARGE RATES (CFS)

ELVN	SPILLWAY Q_1	DAM I Q_2'	DAM II Q_2''	DAM III Q_2'''	TOTAL DAM Q_2	LEFT EMB Q_3	TOTAL Q
SPLR 276	0	0	0	0	0	0	0
277	84	0	0	0	0	0	84
TOD 277.9	220	0	0	0	0	0	220
278.1	256	10	0	1	11	0	267
279	436	129	135	25	289	0	725
279.5	550	227	262	65	554	0	1104
½PMF 279.85	640	305	366	104	775	5	1420
280.6	829	497	625	213	1335	48	2212
281	939	611	780	282	1673	102	2714
PMF 281.1	965	640	820	300	1760	115	2840

Note: Combining the overflow capacities above, the discharge capacity of the low-level outlet is neglected.
Discharge rating curves for Total Q (composite) and Spillway are plotted on sheet 8.



RISDON POND DAM

DISCHARGE RATING CURVES

MA 2/26/81
EO 3/3/81

SHEET D-8 of 17

DETERMINATION OF PEAK OUTFLOW
SHORTCUT ROUTING OF RESERVOIR
CORPS OF ENGINEERS GUIDELINES "SURCHARGE STORAGE ROUTING" ALTERNATE METHOD USED.

FOR 1430 CFS ($\frac{1}{2}$ PMF) THE DISCHARGE RATING CURVE
GIVES ELVN = 279.86
FROM STAGE-STORAGE CURVE FOR THIS ELVN
STORAGE = 5.4 AC-FT

$$STOR_i = \frac{5.4 \times 12}{1.27 \times 640} = 0.08'' \text{ RUN-OFF}$$

$$Q_{P_i} = Q_{P_1}\left(1 - \frac{STOR_i}{9.5}\right)$$

① STOR$_i$ INCHES	② $(1 - \frac{STOR_i}{9.5})$	③ STOR$_i$ AC-FT ① $\times \frac{1.27 \times 640}{12}$	④ Q_{P_i} CFS ② $\times$ 1430	⑤ ELVN FROM STORAGE CURVE USING ③
0.05	0.995	3.39	1423	278.45
0.10	0.989	6.77	1414	280.87

COLUMNS ④ & ⑤ ARE PLOTTED ON DISCHARGE RATING CURVE AND

PEAK OUTFLOW Q = 1420 CFS

MAXIMUM STAGE = 279.85
TOP OF DAM = 277.9

THE DAM IS OVERTOPPED BY 1.95 FT

THE ROUTING IS ALSO DONE FOR PMF

DETERMINATION OF PEAK OUTFLOW

SHORTCUT ROUTING OF RESERVOIR

CORPS OF ENGINEERS GUIDELINES "SURCHARGE STORAGE ROUTING" ALTERNATE METHOD USED.

FOR 2860 CFS (PMF) THE DISCHARGE RATING CURVE GIVES ELEV^N = 281.1

AND FROM STAGE-STORAGE CURVE FOR THIS ELE^N

STORAGE = 7.1 Ac. Ft.

$STOR_i = \frac{7.1 \times 12}{1.27 \times 640} = 0.105''$ RUN-OFF

$Q_{P_i} = Q_{P_1}\left(1 - \frac{STOR_i}{19}\right)$

① STOR i - inches	② $(1 - \frac{STOR_i}{19})$	③ STOR Ac.Ft ① $\times \frac{1.27 \times 640}{12}$	④ Q_{P_i} CFS ② × 2860	⑤ ELEV^N FROM STORAGE CURVE USING ③
0.05	0.997	3.39	2851	278.45
0.1	0.995	6.77	2846	280.87
0.12	0.994	8.13	2843	281.95

COLUMNS ④ & ⑤ ARE PLOTTED ON DISCHARGE RATING CURVE AND

PEAK OUTFLOW = 2845 CFS

MAXIMUM STAGE = 281.1

TOP OF DAM = 277.1

∴ THE DAM IS OVERTOPPED BY 3.2 FT

BREACH ANALYSIS — DOWNSTREAM FAILURE HAZARD BASED UPON CORPS OF ENGINEERS "RULE OF THUMB" GUIDANCE FOR ESTIMATING D/S DAM FAILURE HYDROGRAPHS

BREACH OUTFLOW $Q_b = \frac{8}{27} \times W_b \times \sqrt{g} \times y_o^{3/2}$

HEIGHT FROM CHANNEL BED TO POOL @ TOP OF DAM y_o = 27.2 FT

ESTIMATED BREACH WIDTH W_b = 40% OF MID-HT. LENGTH OF DAM = $0.4 \times 88'$

(MID-HT LENGTH IS BASED UPON P. W. GENOVESE & ASS. INC'S FIELD INFORMATION)

$\therefore Q_b = \frac{8}{27} \times (0.4 \times 88) \times \sqrt{32.2} \times (27.2)^{3/2} \cong$ 8400 CFS

IT IS PRESUMED THAT THE BREACH OCCURS IN DEEPEST SECTION OF THE DAM. THIS SECTION INCLUDES THE SPILLWAY AND THE PIPE OUTLET.

$\therefore$ PEAK FAILURE OUTFLOW Q_p = 8400 CFS
ESTIMATED FAILURE FLOOD DEPTH $\cong$ 0.44 y_o
IMMEDIATELY D/S FROM DAM $\cong$ 12 FT.

PERFORM D/S ROUTING OF PEAK FAILURE OUTFLOW

SECTION AA IS SELECTED AT THE BRIDGE OVER THE OUTFLOW CHANNEL LOCATED 83' FROM THE DAM.

USING MANNING'S EQUATION

$$Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$$

$$= 12.63 A R^{2/3}$$

where $n = 0.03$ assumed (Uniform channel. stone) Per Table 5.6. Open Channel Hydraulics, by Ven Tee Chow and $S = 0.065$ (Based upon P. W. Genovese & Assoc. Inc. field information).

A AND R ARE ESTIMATED BASED UPON FIELD DATA AND USGS MAP INFORMATION

ELVN	A Sq.FT	P	R	$R^{2/3}$	Q CFS
243.3	0	—	—	—	—
250	66.3	23.5	2.82	2.0	1675
253	162.5	60.3	2.7	1.93	3960
255	282.5	83.8	3.4	2.26	8064
256	350.6	95	3.8	2.44	11,110

FROM STAGE AREA AND STAGE DISCHARGE CURVES,

FOR Q_{P_1} = 8400 CFS. ELVN = 254.1 AREA = 270 Sq.FT

VOLUME OF REACH $V_1 = \frac{83 \times 270}{43,560} = 0.55$ Ac.

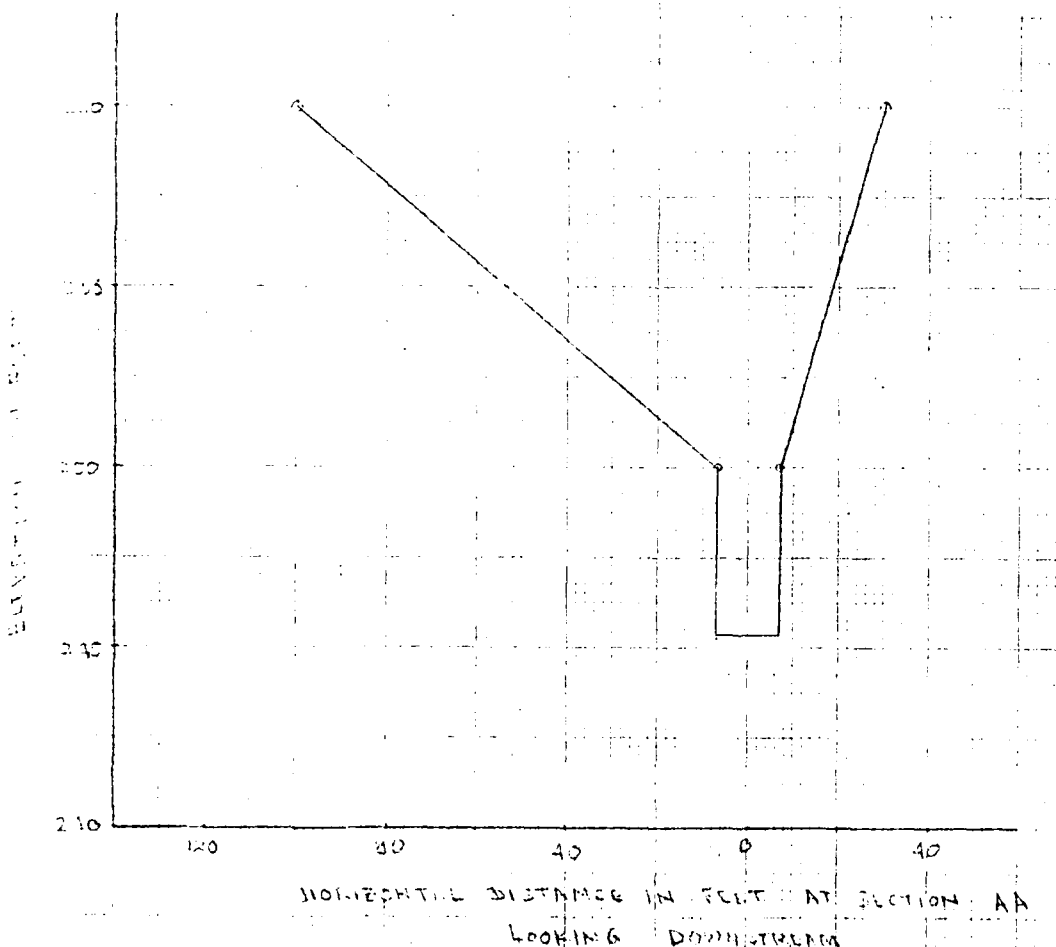
$Q_{P_2} = Q_{P_1}\left(1 - \frac{V_1}{S}\right)$ WHERE S = STORAGE TO TOP OF DAM

$= 8400\left(1 - \frac{0.55}{11}\right) = 7980$ CFS

FROM Q_{P_2} THE STAGE DISCHARGE CURVE GIVES

ELVN = 253.9 AREA = 240 Sq.FT

VOLUME OF REACH $V_2 = \frac{240 \times 83}{43,560} = 0.54$ Ac.

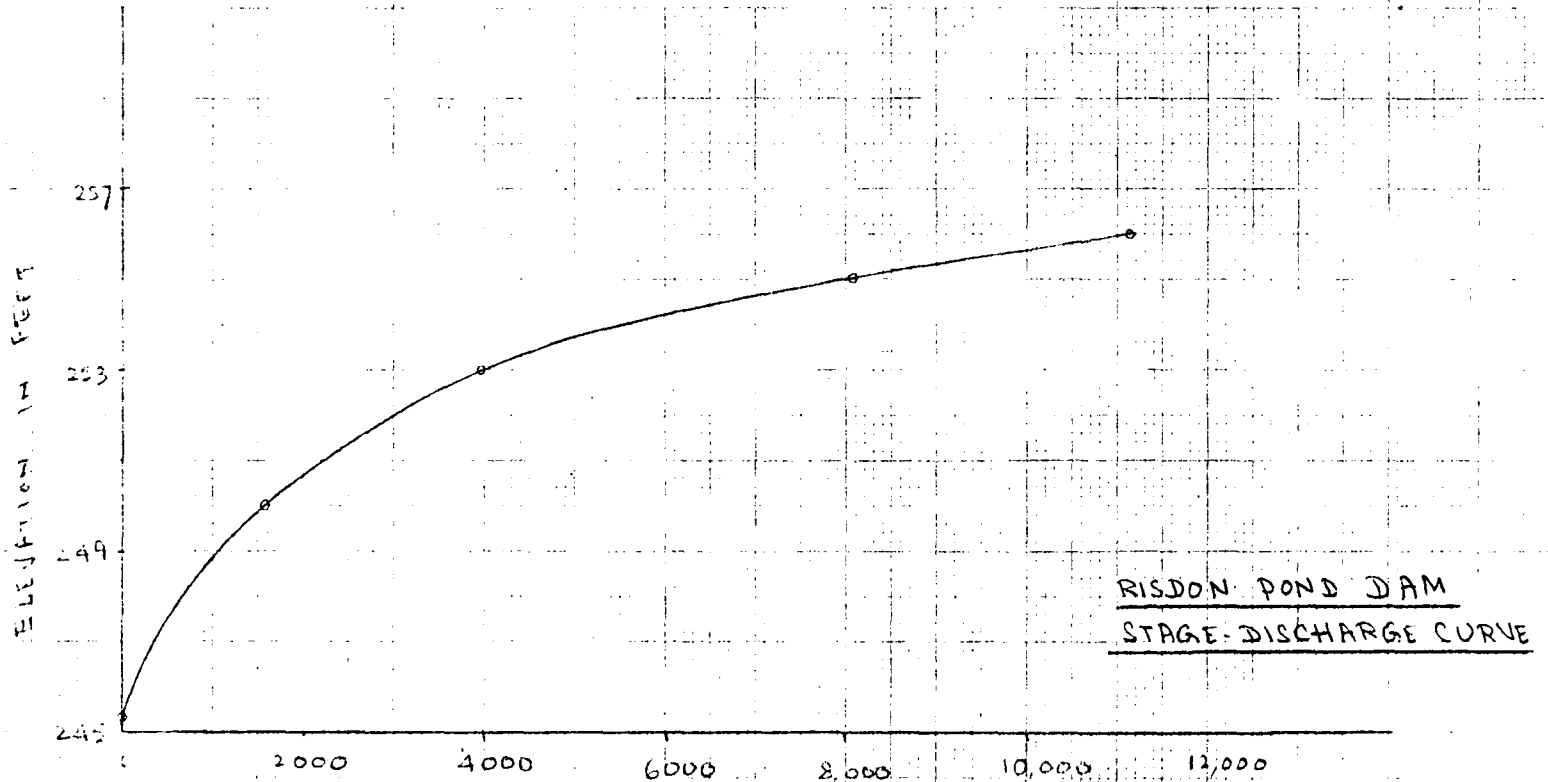


FISDON POND DAM

AREA CURVE

12/6/1 73
10/8/1 T-1

SHEET 2.13 OF 17



RISDON POND DAM

STAGE-DISCHARGE CURVE

SHEET D-14 of 17

NJH 1/2/81

EG 1/9/81

RECOMPUTING $Q_{P_2} = 8400\left(1 - \frac{0.55+0.54}{11}\right) \cong 8000$ CFS

PEAK OUTFLOW Q_{P_2} = 8 000 CFS

FLOOD STAGE AT SECTION AA = 255 NGVD
FLOOD DEPTH AT SECTION AA = 9.7 FT.
VELOCITY = $\frac{8000}{282.5} \cong 28$ FPS (V. HIGH)

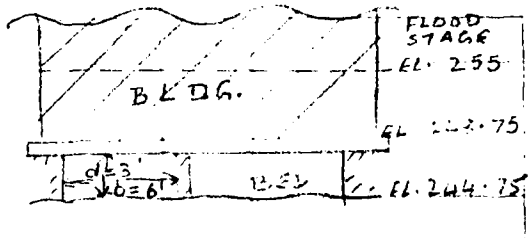
STAGE BEFORE FAILURE
IS ESTIMATED BASED UPON DISCHARGE FROM THE SPILLWAY WITH POOL AT TOP OF DAM, i.e. 220 CFS

FROM THE STAGE-DISCHARGE CURVE AT SECTION AA, THIS DISCHARGE WOULD RESULT IN A STAGE OF 246.6

∴ EST. RAISE IN STAGE AFTER DAM FAILURE =
255.0 − 246.6 = 8.4 FT.

RISDON CO'S MANUFACTURING FACILITY IS LOCATED WITHIN 50 FT OF SECTION AA. THE OUTLET FLOW PASSES BENEATH THIS BUILDING VIA TWO 6'×3' CONCRETE CONDUITS.

THE COMBINED CAPACITY OF THESE TWO CONDUITS IS ESTIMATED TO BE ONLY 400 CFS BASED ∴ $\frac{H}{d} = \frac{9.7}{3}$



(Ref: Open-channel hydraulics by Ven Te Chow. Fig 17-29)

THUS, THESE TWO CONDUITS ARE GROSSLY INADEQUATE FOR THE PEAK OUTFLOW AT DAM FAILURE.

THE FLOOD STAGE OF 255 WOULD CAUSE FLOODING OF THE MAIN FLOOR OF THIS LARGE BUILDING BY 6± FT OF WATER. ALSO, IT IS TO BE NOTED THAT THE VELOCITY OF THE PEAK OUTFLOW IS VERY HIGH. IN ADDITION, A HEAVILY TRAVELLED 4-LANE ROAD CONNECTING STATE HIGHWAY (ROUTE 8) AND MAIN STREET WOULD BE SUBJECTED TO SEVERE FLOODING. THE RISDON MANUFACTURING CO. EMPLOYS NEARLY 120 PEOPLE AND THE PLANT OPERATES ON A 2 SHIFT BASIS PER DAY. IT HAS ITS PLATING DEPARTMENT AT THE REAR OF THE BUILDING FACING THE DAM.

THUS. LOSS OF MORE THAN A FEW LIVES IS CONSIDERED LIKELY DUE TO DAM FAILURE. HENCE, THE RISDON POND DAM HAS A HIGH HAZARD POTENTIAL CLASSIFICATION.

SUMMARY- HYDRAULIC/HYDROLOGIC COMPUTATIONS

TEST FLOOD PEAK INFLOW 1/2PMF 1430 CFS
(PARALLEL COMPUTATIONS HAVE BEEN PERFORMED FOR PMF PEAK INFLOW & RESULTS ARE SUMMARIZED BELOW)

PERFORMANCE AT PEAK FLOOD CONDITIONS

	PMF	½PMF
PEAK INFLOWS CFS	2860	1430
PEAK OUTFLOWS CFS	2840	1420
SPILL.CAP.TO TOP OF DAM(EL.277.9NGVD)CFS	220	220
SP. CAP. TO TOP OF DAM % OF PEAK OUTFLOW	8	16
SP. CAP. TO PEAK FLOOD ELVN CFS	965	640
SP. CAP. TO PEAK FLOOD ELVN % OF PEAK OUTFLOW	34	45
PERFORMANCE:		
MAXIMUM POOL ELVN NGVD	281.1	279.85
MAX. SURCHARGE HEIGHT ABOVE SP.CREST FT.	5.1	3.85
DAM OVERTOPPED FT	3.2	1.95

DOWNSTREAM FAILURE CONDITIONS

PEAK FAILURE OUTFLOW 8400 CFS
FLOOD DEPTH IMMEDIATELY D/S FROM DAM 12 FT
CONDITIONS AT THE IMPACT AREA: (SECTION AA)
EST. STAGE BEFORE FAILURE 246.6 NGVD
EST. STAGE AFTER FAILURE WITH 8000 CFS 255 NGVD
EST. RAISE IN STAGE AFTER FAILURE ΔY 8.4 FT

APPENDIX E

INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

NOT AVAILABLE AT THIS TIME